

# TLM-4505 A CARTRIDGE LOADED RANDOM ACCESS MEMORY



FOR THE FIRST TIME  
A RANDOM ACCESS MEMORY  
USING MAGNETIC TAPE

- Fastest Operation Available
- Automatic Cartridge Loading
- Unique Check-Read-After-Write Capability
- Non-Contact Recording
- Linear Head Positioning
- Extreme Dependability
- Simple Servicing



Figure 1. The Potter RAM  
(a random access memory system)  
Model TLM-4505, Shown with Model ACC-8606 Cartridge

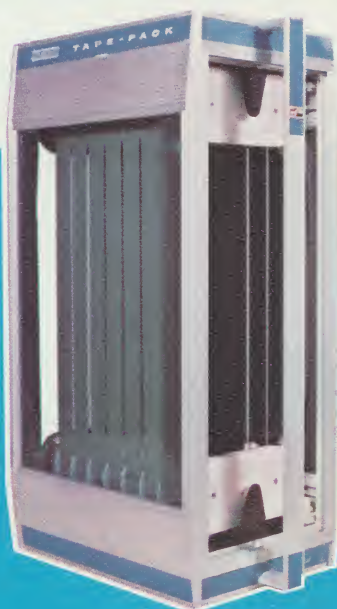


Figure 2. Potter Tape Pack  
Cartridge, Model ACC-8606

## TAPE PACK FEATURES

- High Capacity — Over 50 Million Bits
- Low Price — Lowest Available
- Complete Data Security
- Interchangeable Cartridges
- Rugged Strength, Sealed Enclosure
- Lightweight — Readily Stacked
- Replaceable Low-Cost Storage Element

## AUTOMATIC CARTRIDGE LOADING — Approximately 15 Seconds!



Operator Selects Tape Pack Cartridge.



Places Cartridge on Loading Carriage.



Presses "LOAD" Pushbutton. Fully Automatic Startup.

Figure 3. Cartridge loading is as simple for the operator as it is possible to make it. The cartridge is placed on the machine carriage; a latch snaps it secure. From this point everything is automatic. The operator

simply presses the "LOAD" pushbutton and walks away, leaving the machine to load the cartridge, start up automatically, and signal the "ready" condition, all within a few seconds.

## DRAMATIC STEP FORWARD IN PERFORMANCE CHARACTERISTICS!

Unlike any other machine in its class, the RAM can check-read data immediately after writing. This makes a dramatic difference in the performance characteristic. While other machines are occupied with the extra revolution of the recording medium, necessary to check-read, the RAM has already started the next access. Data throughput rates are enormously improved, and there is no need for the special data sequencing which attempts to minimize latency effects.

The remarkable characteristics of the RAM concept provide advanced performance plus simplified machine design, high reliability and lowest cost per bit stored. This is truly a breakthrough in design approach.

Comparisons between the RAM and other ma-

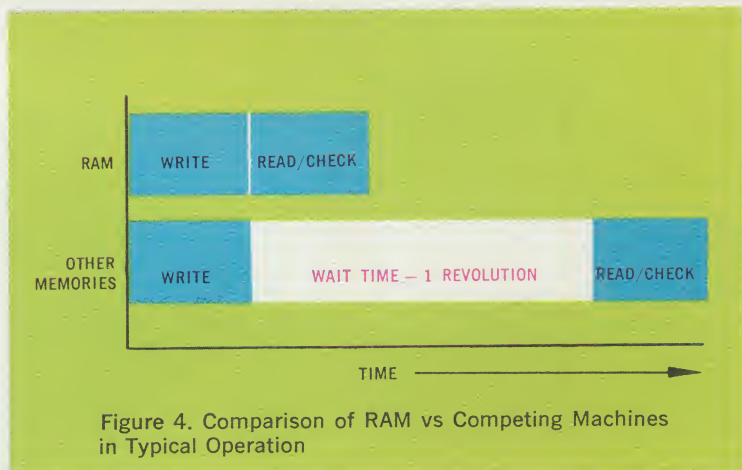


Figure 4. Comparison of RAM vs Competing Machines in Typical Operation

chines show typical operations being accomplished in half the usual time, with cartridge capacity doubled and cost per bit stored reduced to one quarter. In addition, vulnerable recording discs have been replaced by highly shock resistant magnetic tape sealed in rugged Tape Pack cartridges.

The Potter RAM is a cartridge loaded random access system for use with medium and low cost digital computer systems. Typical applications are: inventory control, computer programming, real-time data processing, and mathematical and scientific analyses . . . wherever rapid access to a volume of information is required, and where the information is too large to be economically accommodated by ferrite core memory systems.

Information is recorded serially in a multiplicity of tracks on loops of tape, and any information may be written or read at random by transmitting address information to the unit together with an appropriate command signal.

All channels have equal storage capacity and equal bit packing density. Thus, "zoned" arrangements of information, as used with disc memories to achieve reasonable storage efficiency, are not required.

### UNIQUE TAPE PACK CARTRIDGE

The Model TLM-4505 accepts a Potter Model ACC-8606 Tape Pack Cartridge which has a storage capacity of 50.3 million bits of information. The tape loop assembly is totally enclosed within a dust-tight, rigid aluminum frame case. A door on the end of the cartridge case provides passage for the drive mechanism when in use. Plexiglass side and end panels permit immediate visual inspection of the storage elements at all times.

The complete cartridge assembly is highly resistant to rough handling. The rectangular form, convenience of handling, and light weight of the cartridge permits stacked storage in minimum space and very easy handling. The absence of close tolerance internal fittings avoid misalignment by careless handling, and the tape loops are inherently not subject to deformation and damage by shock and vibration.

Non-contact Potter high density recording is used in a "write broad-read-narrow" single track configuration. No permanent errors occur and the probability of transient errors are so low as to be a negligible factor.

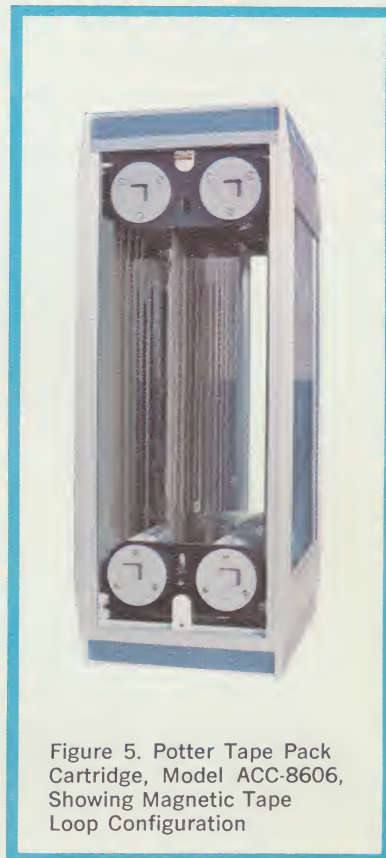


Figure 5. Potter Tape Pack Cartridge, Model ACC-8606, Showing Magnetic Tape Loop Configuration

## PRINCIPLES OF OPERATION

### THE DRIVE SYSTEM

The loops of high quality digital magnetic recording tape in the cartridge each have an associated drive unit on the machine. Figure 6 shows the position of the tape loop which clears the drive assembly and the head as the cartridge is loaded, with the capstan stationary. When the tape loops are positioned, vacuum is applied to the buffer chamber above the capstan, deflecting the tape so that its backing surface makes a non-slipping contact with the surface of the capstan,

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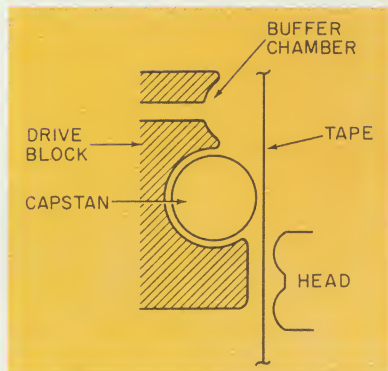


Figure 6. Position of Tape Loop As Cartridge Is Loaded

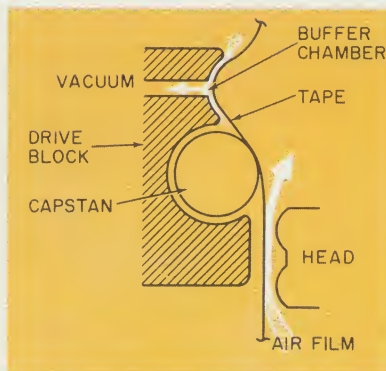


Figure 7. Tape Loop in Driving Condition

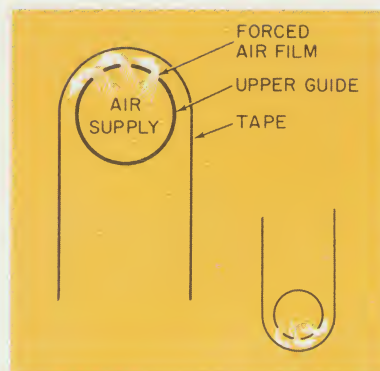


Figure 8. The Tape Loop is Entirely Supported on An Air Cushion While in Motion

## PRINCIPLES OF OPERATION *continued*

### MULTIPLE DRIVE BLOCKS

The individual drive blocks are arranged in two compact groups on the faceplate of the machine, with a common capstan serving each group. (Figure 9). A common vacuum supply is connected to all of the buffer chambers so that all loops are engaged in the driving position simultaneously, as part of the automatic load cycle. The twin capstans run in specially designed long-life bearings. Figure 10 shows the appearance of the drive assembly with one group of drive blocks removed to provide access to the head post. The vacuum and pressure porting can be seen and also the location of the capstan threading the remaining group of drive blocks. There are sixteen drive block sections in all, providing a 16 loop drive.

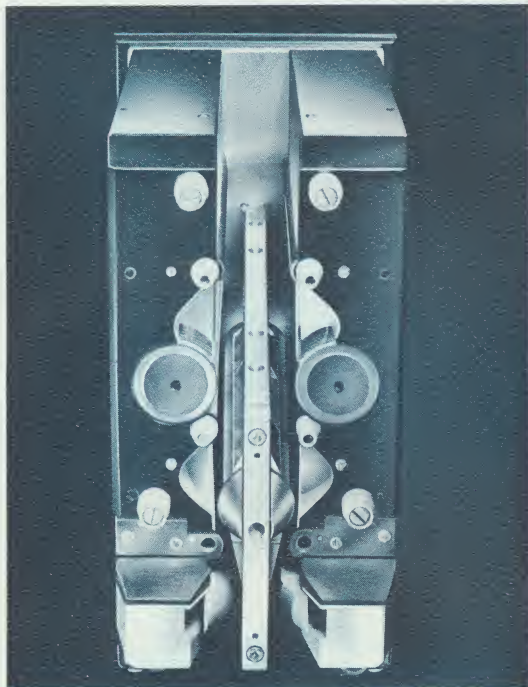


Figure 9. Multiple Drive Block Assembly

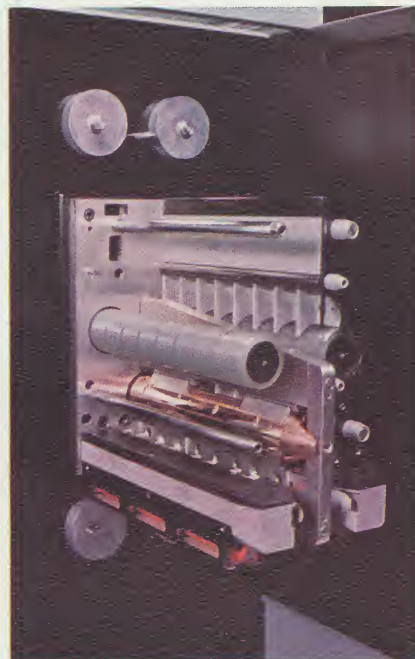


Figure 10. Multiple Drive Block Assembly with One Group of Drive Blocks Removed

### HEAD POST ASSEMBLY

All of the write/read heads are mounted in a common head post located between the two groups of tape loops. The position of the head post can be seen in Figure 10. The general arrangement of the head post itself is as shown in Figure 11. The lower row of heads provides the writing function and the upper row the reading function. The heads are arranged in sections so that seven writing and seven reading heads are presented to each of the eight recording surfaces. A similar arrangement prevails on the other side of the head post to furnish reading and writing functions for the alternate group of eight loops.

The profile of the head post is contoured with a smooth surface finish, to define the desired stable flying attitude for the tape. The head post forms a rigid beam structure which permits the heads to be traversed over the recording surfaces under the control of the head post positioning mechanism.

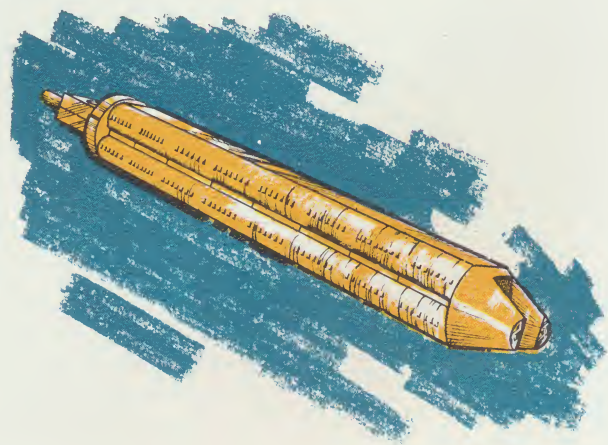


Figure 11. Write/Read Head Post

## HEAD POSITIONING MECHANISM

Because the head positioning system demands only a linear movement of a single assembly over a very short distance, a simple mechanism is possible. This takes the form of a binary input positioning linkage sometimes referred to as a "whiffletree." A diagrammatic representation of the head positioning mechanism is shown in Figure 1.

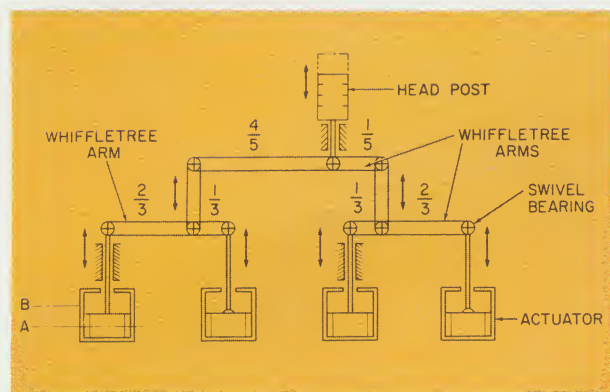


Figure 12. Diagrammatic Representation of Head Positioning Mechanism Showing Linkage Relationships

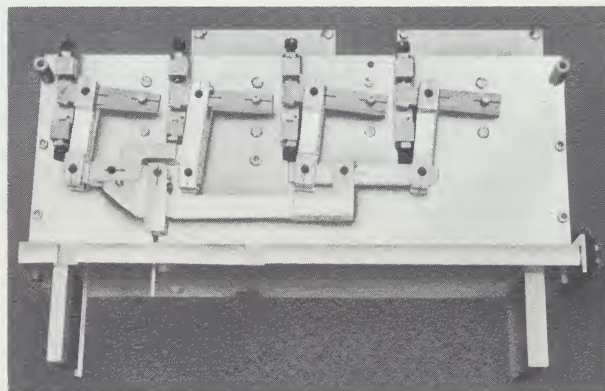


Figure 13. Head Positioning Mechanism

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The average access time to any stored record at random is made up of the average head positioning time plus an average latency time of one half revolution of the recording medium.

Check reading is performed immediately after writing. It is not necessary for the recording medium to make an extra revolution to check read, as required in other random access devices.

This is illustrated by the characteristic shown in Figure 14. At point A the first access to a record has been achieved in time  $T_1$ . Normally the time  $T_1$  would elapse before check reading could be carried out at point B'. The RAM characteristic follows line AB, check reading at B still being achieved in time  $T_1$  plus the very small increment of time which elapses due to gap spacing. The elimination of wait time for check reading results in higher processing rates.

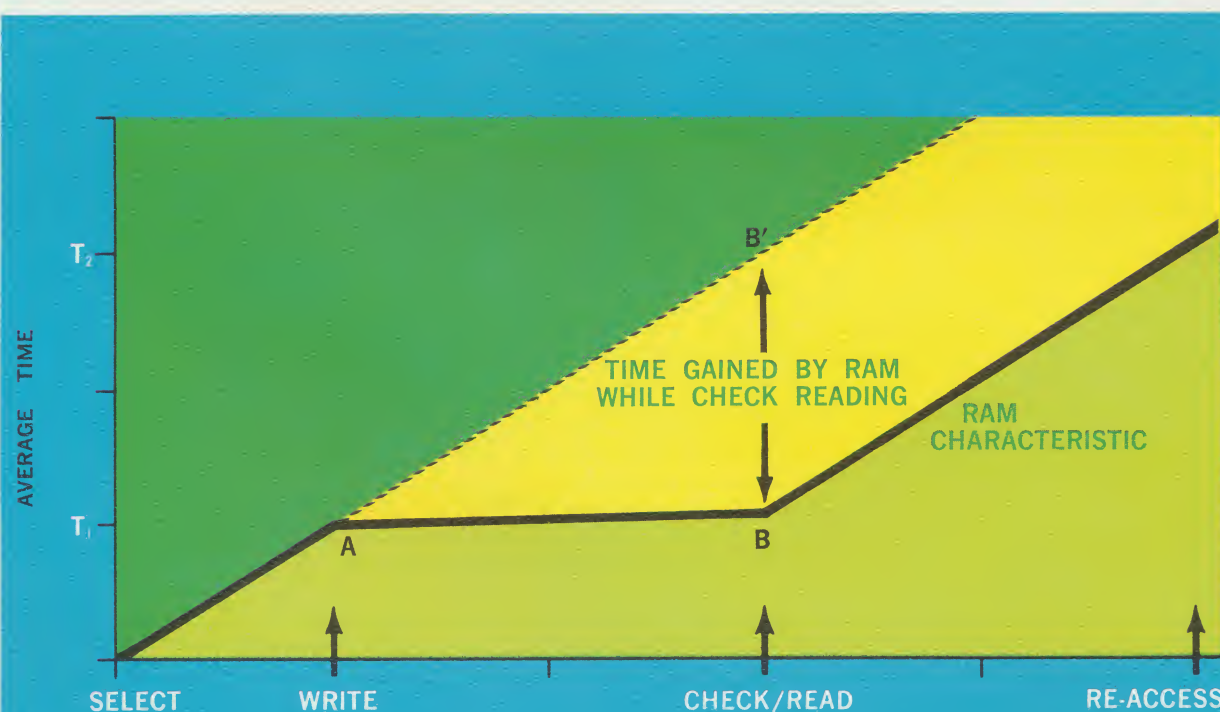


Figure 14. Immediate Check-Reading-After-Writing Gives the RAM Faster Access Time

## PERFORMANCE CHARACTERISTICS

*continued*

### DATA SECURITY

As the design approach of the RAM is reviewed feature by feature, it becomes obvious that a vital supplement to the higher performance/price ratio is the new order of data security that is realized. The use of a flexible recording medium eliminates machine damage and information loss resulting from head and disk crashes encountered in other random access memories. The sealed cartridges do not require the rigorous and elaborate machine room procedures which are essential to establish confidence in disk cartridge storage.

Spare tracks on the recording surfaces are unnecessary. Under normal conditions, the tape loops are practically indestructible and it is possible to recover data even in the extreme case of catastrophic damage to a cartridge housing.

### SIMPLE MAINTENANCE

The maintenance required to insure reliability is reduced to a minimum and made exceptionally convenient and quick. After sliding back the transparent machine cover, drive blocks can be removed from their mountings after unfastening only two captive screws. This exposes the head post completely in a few seconds. The conveniently laid out components are all easily accessible in the frame assembly of the unit, which has removable cover panels.

### EQUIPMENT

The complete Model TLM-4505 RAM System comprises:

- Free standing cabinet of welded box frame construction with removable cover panels containing:
  - Faceplate and multiple drive block assembly with group drive actuators
  - Twin capstans and motor drive
  - Read/write head assembly with separate check read after write head
  - Head positioning mechanism
  - Cartridge holder and auto-load mechanism
  - Drive selection circuits
  - Head selection circuits
  - Load sequence control circuits and interlocks
  - Control pushbuttons: Power on/off, load and unload signal lamps with unit "ready" indicator
  - Vacuum generator and tape loop bearing air supply system
  - Power supplies, interconnecting wiring, cables, terminals, etc.

The equipment is furnished complete and ready for interconnection and operation with a suitable control source.

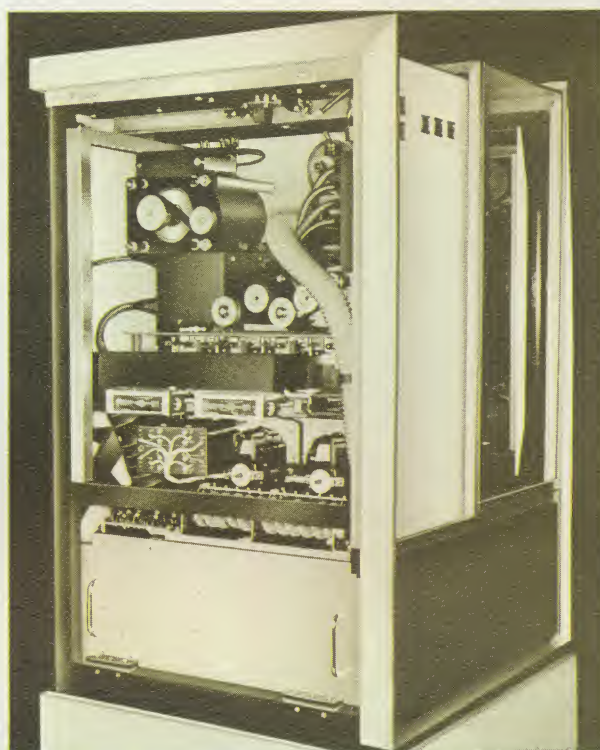


Figure 15. RAM with End Panel Removed

### TAPE PACK CARTRIDGE

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Complete specification for the TLM-4505 RAM and ACC-8606 Tape Pack are given on the following page. For further information, write, wire or call: General Sales Manager, Potter Instrument Company, Inc., 151 Sunnyside Boulevard, Plainview, New York (11803). Telephone: 516 Overbrook 1-3200. TWX: 516-433-9320. Cable: PICO.

## SPECIFICATIONS

MEMORY CONFIGURATION	Interchangeable cartridge type
METHOD OF RECORDING	Non-contact magnetic tape loops with Potter high-density recording in a "write broad-read narrow" single track configuration
STORAGE CAPACITY	50.3 million bits
INFORMATION PER TRACK	28,000 bits
INFORMATION PER CYLINDER	196,000 bits
DATA TRANSFER RATE (BITS)	600 kc/s
INFORMATION PACKING DENSITY	1,000 bits/inch, recorded serially
HEAD POSITIONING TIME	45 milliseconds, minimum 80 milliseconds, maximum
AVERAGE HEAD POSITIONING TIME	62.5 milliseconds
AVERAGE LATENCY TIME	25.0 milliseconds
AVERAGE ACCESS TIME	87.5 milliseconds
CHECK READ LATENCY TIME	1.7 milliseconds
AVERAGE CHECK READ/AFTER/WRITE CYCLE TIME	89.2 milliseconds (based on average access time)
TIME TO SCAN TRACK	50.0 milliseconds
CARTRIDGE CHANGE TIME	17 seconds, approximately
NUMBER OF TAPE LOOPS PER CARTRIDGE	16
NUMBER OF TRACKS PER TAPE LOOP	112
LENGTH OF TAPE LOOP	30 inches
TAPE WIDTH	2 inches
RECORDING LENGTH	28 inches
TAPE SPEED	600 ips
NUMBER OF HEADS PER RECORDING SURFACE	7
NUMBER OF HEAD POSITIONS	16
CYLINDER CAPACITY	Content of 7 tracks
READ/WRITE HEAD SEPARATION	1 inch, nominal
CARTRIDGE LIFE EXPECTANCY	5 years, typical

## MODES OF OPERATION & CONTROL SIGNALS

### Signals TO Unit

TRACK LOCATE (16 LOOP SYSTEM)	parallel input comprising 11 binary bits
WRITE ENABLE	Control Signal (level)
DATA INPUT	Serially at selected frequency

### Signals FROM Unit

EQUIPMENT READY	DC level = 6 volts in ready condition
DATA INPUT	Serially at selected frequency

POWER	110/120V or 220/240V, 50/60 cps
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### DIMENSIONS

CARTRIDGE, MODEL ACC-8606, 16 LOOPS, 50.3 MILLION BITS	approximately 13" W x 22" H x 8" D
CARTRIDGE STACKING FACTOR	96-98%
MACHINE (OVERALL DIMENSIONS)	approximately 48" W x 51" H x 23" D

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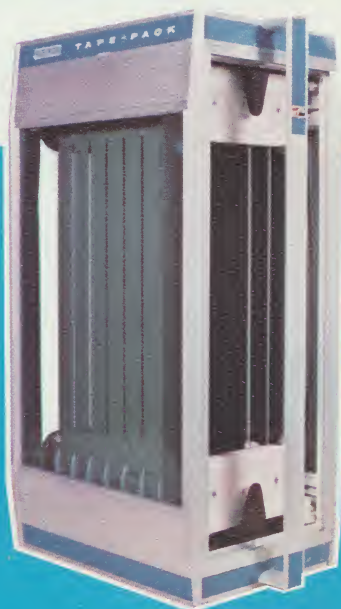


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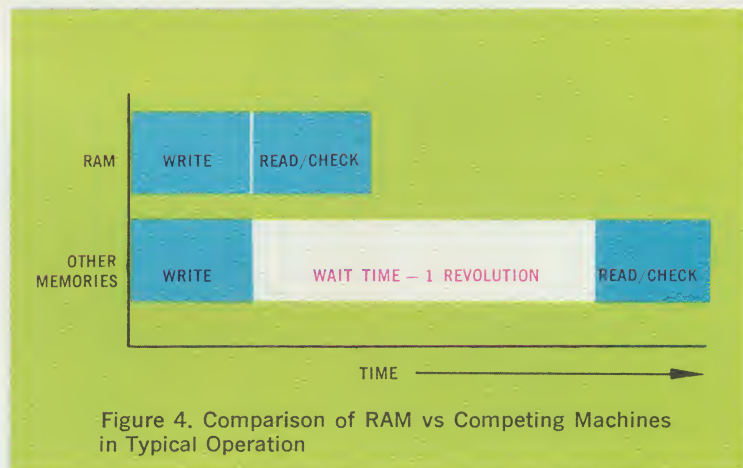


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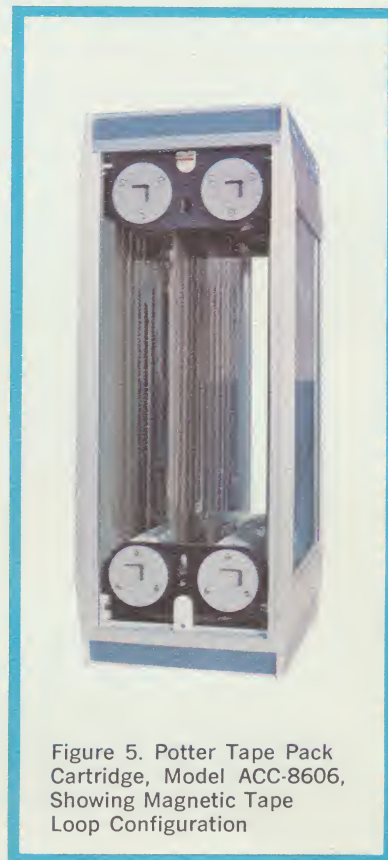


Figure 5. Potter Tape Pack Cartridge, Model ACC-8606, Showing Magnetic Tape Loop Configuration

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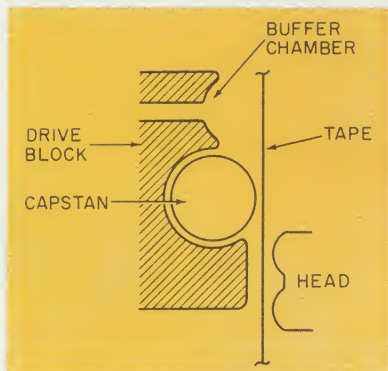


Figure 6. Position of Tape Loop As Cartridge Is Loaded

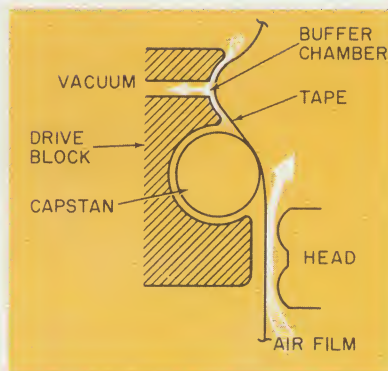


Figure 7. Tape Loop in Driving Condition

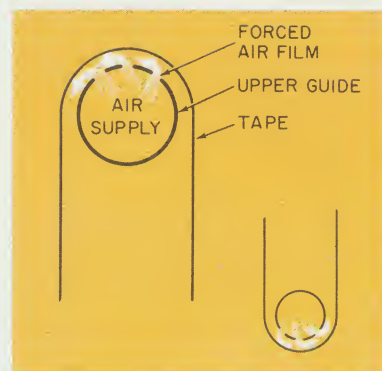


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**PRINCIPLES OF OPERATION** *continued***MULTIPLE DRIVE BLOCKS**

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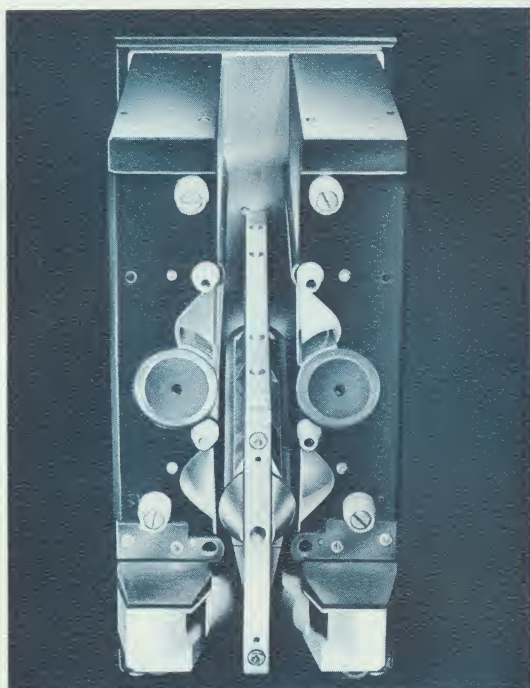


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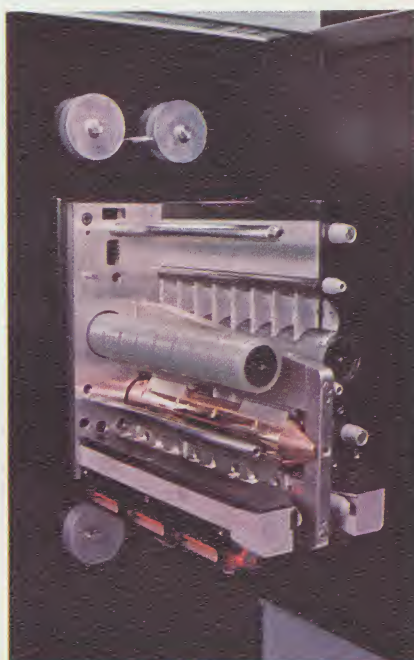


Figure 10. Multiple Drive Block Assembly with One Group of Drive Blocks Removed

**HEAD POST ASSEMBLY**

All of the write/read heads are mounted in a common head post located between the two groups of tape loops. The position of the head post can be seen in Figure 10. The general arrangement of the head post itself is as shown in Figure 11. The lower row of heads provides the writing function and the upper row the reading function. The heads are arranged in sections so that seven writing and seven reading heads are presented to each of the eight recording surfaces. A similar arrangement prevails on the other side of the head post to furnish reading and writing functions for the alternate group of eight loops.

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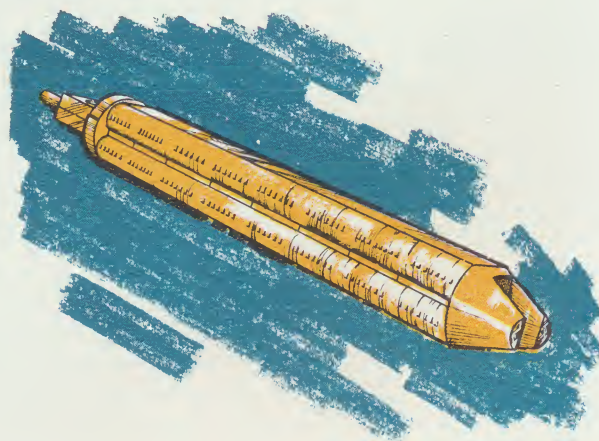


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### HEAD POSITIONING MECHANISM

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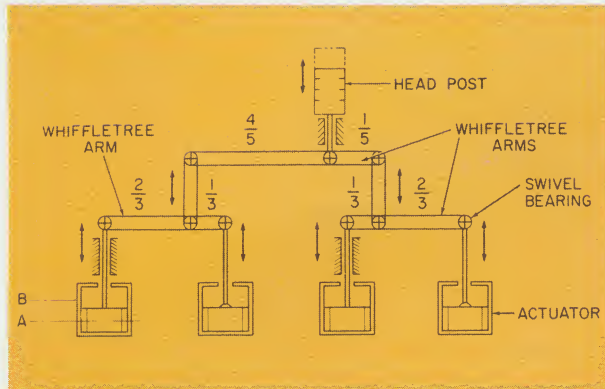


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ism showing linkage relationships is given in Figure 12. Four equal amplitude input deflections acquire binary weightings, 1, 2, 8, and 4, from the linkage relationships, providing 16 precisely repeatable positions of the head post with very fast head shifting. The actual head positioning mechanism is shown in Figure 13.

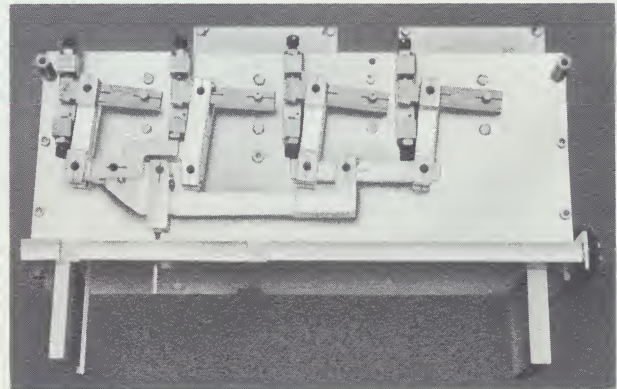


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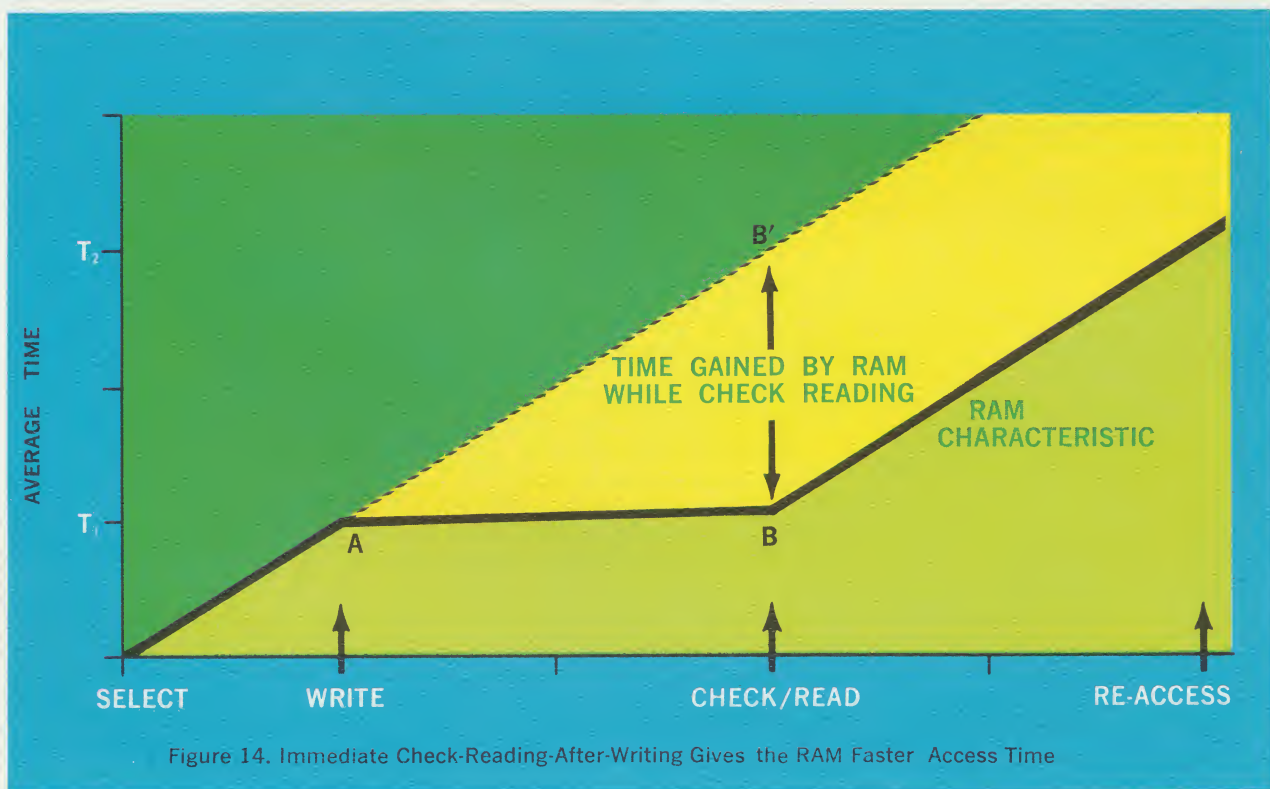


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## PERFORMANCE CHARACTERISTICS

*continued*

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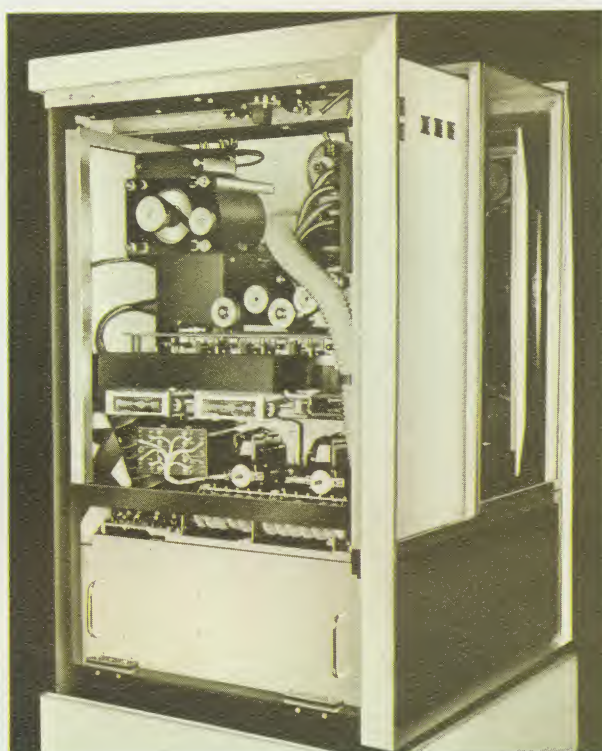


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MEMORY CONFIGURATION	Interchangeable cartridge type
METHOD OF RECORDING	Non-contact magnetic tape loops with Potter high-density recording in a "write broad-read narrow" single track configuration
STORAGE CAPACITY	50.3 million bits
INFORMATION PER TRACK	28,000 bits
INFORMATION PER CYLINDER	196,000 bits
DATA TRANSFER RATE (BITS)	600 kc/s
INFORMATION PACKING DENSITY	1,000 bits/inch, recorded serially
HEAD POSITIONING TIME	45 milliseconds, minimum 80 milliseconds, maximum
AVERAGE HEAD POSITIONING TIME	62.5 milliseconds
AVERAGE LATENCY TIME	25.0 milliseconds
AVERAGE ACCESS TIME	87.5 milliseconds
CHECK READ LATENCY TIME	1.7 milliseconds
AVERAGE CHECK READ/AFTER/WRITE CYCLE TIME	89.2 milliseconds (based on average access time)
TIME TO SCAN TRACK	50.0 milliseconds
CARTRIDGE CHANGE TIME	17 seconds, approximately
NUMBER OF TAPE LOOPS PER CARTRIDGE	16
NUMBER OF TRACKS PER TAPE LOOP	112
LENGTH OF TAPE LOOP	30 inches
TAPE WIDTH	2 inches
RECORDING LENGTH	28 inches
TAPE SPEED	600 ips
NUMBER OF HEADS PER RECORDING SURFACE	7
NUMBER OF HEAD POSITIONS	16
CYLINDER CAPACITY	Content of 7 tracks
READ/WRITE HEAD SEPARATION	1 inch, nominal
CARTRIDGE LIFE EXPECTANCY	5 years, typical

## MODES OF OPERATION & CONTROL SIGNALS

### Signals TO Unit

TRACK LOCATE (16 LOOP SYSTEM)	parallel input comprising 11 binary bits
WRITE ENABLE	Control Signal (level)
DATA INPUT	Serially at selected frequency

### Signals FROM Unit

EQUIPMENT READY	DC level = 6 volts in ready condition
DATA INPUT	Serially at selected frequency

POWER	110/120V or 220/240V, 50/60 cps
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### DIMENSIONS

CARTRIDGE, MODEL ACC-8606, 16 LOOPS, 50.3 MILLION BITS	approximately 13" W x 22" H x 8" D
CARTRIDGE STACKING FACTOR	96-98%
MACHINE (OVERALL DIMENSIONS)	approximately 48" W x 51" H x 23" D

## About **POTTER**®

**POTTER WORLDWIDE FIELD SERVICE AND LOGISTICS PROGRAM** — Repair centers in strategic locations within the continental United States and abroad have been established to support the entire Potter product line.

Staffed by highly-trained field representatives, these repair centers are equipped to effect on-site installation of equipments and to perform quality repair, maintenance and overhaul.

Supplementing this capability, if a customer prefers to provide his own equipment support, Potter has established standard instruction courses to train customer personnel, either at Potter or in the field.

A Spare Parts Department, backed up by an extremely large inventory and streamlined order processing, is available for customer convenience and economy. This inventory permits the customer to realize virtual elimination of downtime as well as savings on spare parts dollars by offering expeditious delivery for replaceable parts. Delivery is available in 24 hours to meet customer emergency requirements—within 72 hours for standard parts under normal conditions. Potter also offers provisioning and logistics capabilities to meet all existing military specifications.

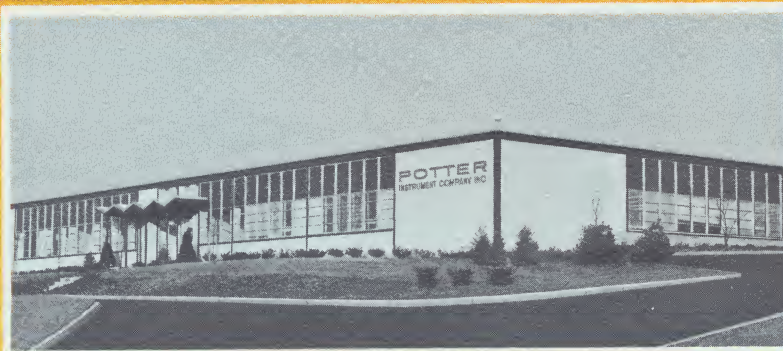
The Potter field service and logistics program is one of the finest in the EDP equipment industry. With reliable, quality-engineered equipment, supported by comprehensive field service, Potter guarantees satisfaction.



**POTTER PLANTS** — Tape transport production is carried on in this modern 62,000 sq. ft. plant on Sunnyside Boulevard, Plainview, New York. Building also houses corporate offices, sales, engineering and research groups.

East Bethpage Road plant (below), completed in 1963, produces high-speed printers. A third plant in Luquillo, Puerto Rico, manufactures magnetic and photoelectric recording and playback heads. Total manufacturing space in all Potter plants exceeds 110,000 sq. ft.

Present Potter employment is in excess of 650 people.



### SALES OFFICES

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151 Sunnyside Boulevard  
Plainview, Long Island, New York  
(516) OVERbrook 1-3200  
TWX: 516-433-9320  
CABLE: PICO

**Potter Instrument Company, Inc.**  
Los Angeles (La Canada), Calif.  
1041 Foothill Boulevard  
(213) MURray 1-5845  
TWX: 213-790-7847

**Potter Instrument Company, Inc.**  
Phoenix, Arizona  
(602) ENTERprise 150

### INTERNATIONAL SALES

**Potter Instrument Company, Limited**  
McGraw-Hill House  
Shoppenhangers Road  
Maidenhead, Berkshire, England  
Telephone MAidenhead 20361  
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**POTTER INSTRUMENT COMPANY, INC.**

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ATTN.: GENERAL SALES MANAGER

**FOR MORE INFORMATION**  
on POTTER products  
fill out and send the  
attached card. (Over)



**PLEASE SEND ADDITIONAL INFORMATION  
ON THE PRODUCTS CHECKED:**

- \_\_\_\_\_ **Magnetic Tape Transports & Systems**  
\_\_\_\_\_ Incremental Tape Transports  
\_\_\_\_\_ MT-24 Transport — 1-36 ips  
\_\_\_\_\_ MT-36 Transport — 1-50 ips  
\_\_\_\_\_ MT-75 Transport — 1-75 ips  
\_\_\_\_\_ MT-120 Transport — 1-120 ips  
\_\_\_\_\_ M906II-2 Transport — 1-150 ips  
\_\_\_\_\_ Quick-Lock Hubs
- \_\_\_\_\_ **Read/Write Amplifiers**  
\_\_\_\_\_ Switching Amplifiers
- \_\_\_\_\_ **Record/Playback Magnetic Heads**
- \_\_\_\_\_ **High Density Recording System**
- \_\_\_\_\_ **Off-Line Print Systems**  
\_\_\_\_\_ Graphic Print System
- \_\_\_\_\_ **High-Speed Line Printers**
- \_\_\_\_\_ **Random Access Memory Systems**
- \_\_\_\_\_ **Machine Calibration Equipment**

Special product interest or application \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- ☐ **Please have engineer call**
- ☐ **Please arrange for a demonstration**
- ☐ **Add my name to your permanent mailing list**
- ☐ **Send additional technical data and prices**

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**POTTER INSTRUMENT COMPANY, INC.**

151 Sunnyside Boulevard • Plainview, New York (11803) • 516 OVerbrook 1-3200

Dear Sir:

Thank you for your recent inquiry.

The revolutionary new RAM<sup>®</sup> is a new cartridge loaded random access memory system which establishes a breakthrough in random access memories. The RAM is a fast access device having a storage capacity in excess of 50 million bits of information, and is 30% faster in all modes of operation than any presently used system. The RAM is available at less than half the cost of any presently available memory system.

The RAM also is the first cartridge loaded random access memory system to provide an immediate check-read-after-write capability. Check reading is performed immediately after writing: it is not necessary for the recording medium to make an additional full revolution of the recording medium to check read, as is required in other memories.

A unique drive system permits the use of high density magnetic tape loops as the recording medium. Exceptionally long machine and cartridge life is achieved by using air-floating techniques for the tape loops. The recording medium, when in operation, never makes contact with any fixed surface. Magnetic tape, a flexible storage medium, flies over the head, thus avoiding the well-known difficulties of flying head techniques and a rigid recording surface. The drive mechanism provides operational reliability, has no critically adjusted moving parts, and is highly resistant to shock and vibration. Accurate head positioning is achieved by linear movement of a common head post actuated by a simple mechanical linkage.

Each Tape Pack Cartridge provides 50.2 million bits of information: 196,000 bits per cylinder and 1000 bits per inch of tape. Cartridges are interchangeable to permit processing of many different files on one machine.

In contrast to magnetic disks used in other memories, the flexible substrate eliminates the need for critical mechanical adjustments and results in a lower-cost package as well as one much less susceptible to damage. There is no danger of data loss due to rough handling. "Handle with care" treatment associated with conventional disk cartridges is completely eliminated. This feature is essential in any retrieval system for the security of vital company records.

<sup>®</sup> RAM is a registered trademark of Potter Instrument Company, Inc.

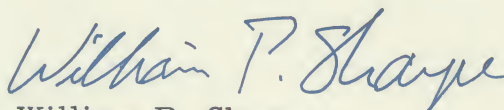
These are only some of the exceptional performance characteristics of the Potter RAM. The product catalog enclosed provides complete technical information.

Prices range from \$12,000 to \$18,000, depending upon equipment requirements. Units are available for delivery six months after receipt of order.

For further information on the revolutionary new RAM and other Potter peripheral equipments, contact your Potter sales representative or return the reply card attached to the enclosure.

Very truly yours,

POTTER INSTRUMENT COMPANY, INC.

A handwritten signature in blue ink that reads "William P. Sharpe". The signature is written in a cursive style with a large, stylized 'W' and 'S'.

William P. Sharpe  
General Sales Manager


**POTTER**
**HOME OFFICE**

**POTTER INSTRUMENT COMPANY, INC.**  
 151 Sunnyside Boulevard  
 Plainview, Long Island, New York (11803)  
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 TWX: 516-433-9320

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 Telephone 05, 47 99 66

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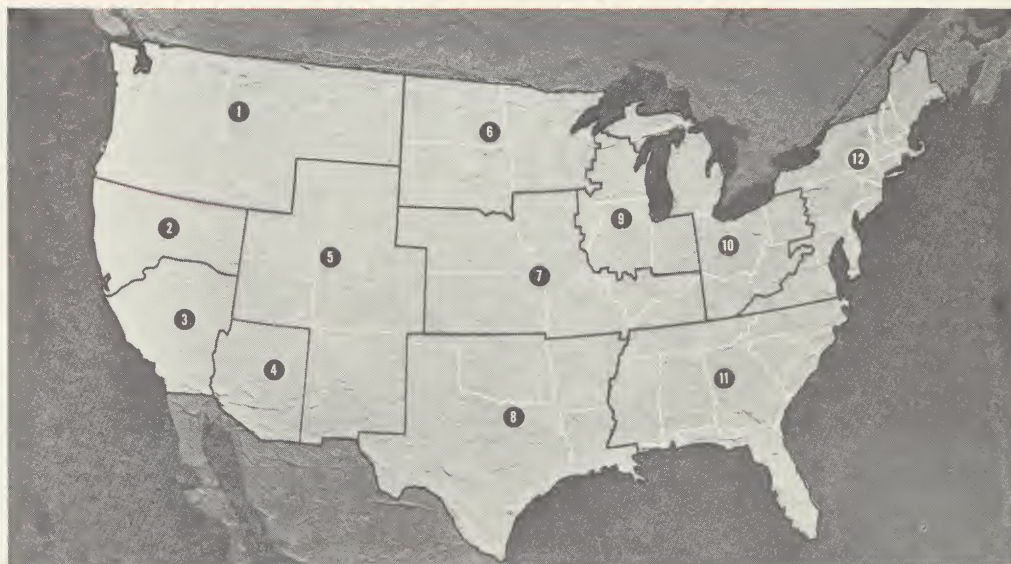
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**INTERNATIONAL DATA PRODUCTS, INC.**  
 Post Office Box 196, Road 3  
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 Telephone Luquillo 729-2880

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